CLAIMS

1. A method for producing differentiated or partially differentiated neurons which method includes

providing

a source of neurectoderm cells which are isolated or otherwise derived from sources other than adult or foetal brain tissue;

a culture medium; and

a growth factor from the neural growth factor (NGF) family;

culturing the cells in the culture medium and in the presence or absence of the NGF growth factor to produce differentiated or partially differentiated neurons.

2. A method according to Claim 1, wherein the culturing step is conducted in the presence of the NGF growth factor.

3. A method according to Claim 1, wherein the neurectoderm cells are *in vitro* derived neurectoderm cells.

4. A method according to Claim 3, wherein the neurectoderm cells are characterised in that they are

essentially homogeneous;

able to differentiate on to all neural cell types; and

unpatterned.

5. A method according to Claim 4, wherein the neurectoderm cells are derived from differentiation of early primitive ectoderm-like (EPL) cells.

6. A method according to Claim 5, wherein the culturing step produces a heterogeneous cell population including neurons, the method further including subsequent to the culturing step,

selecting neurons from the heterogeneous cell population.

7. A method according to Claim 6, wherein the selection method utilises markers for neural cells, including cell surface markers, gene expression markers and morphology.

8. A method for producing dopaminergic (DA) neurons, which method includes

providing

a source of neurectoderm cells which are isolated or otherwise derived from sources other than adult or foetal brain tissue;

a culture medium;

a growth factor from the neural growth factor (NGF) family; and

a source of dopamine; and

culturing the cells in the presence of the culture medium and in the presence of the NGF growth factor and dopamine to produce differentiated or partially differentiated dopaminergic (DA) neurons.

9. A method according to Claim 8, wherein the neurectoderm cells are *in vitro* derived neurectoderm cells.

10. A method according to Claim 9, wherein the neurectoderm cells are derived from differentiation of early primitive ectoderm-like (EPL) cells.

11. A method according to Claim 10, wherein the resulting cell population contains a significant amount of cells that stain positive for TH.

12. A method according to Claim 11, wherein the TH positive cells resemble nerve cells morphologically, including the presence of axon-like projections.

13. A method according to Claim 8, wherein the culture medium is a conditioned medium including Dulbecco's Modified Eagles Medium (DMEM) and foetal calf serum (FCS).

14. A method according to Claim 13, wherein the culture medium further includes FGF2 and exhibits a high glucose content.

15. A method according to Claim 8, further including the step of separating the cells from the conditioned medium.

16. A method according to Claim 15, wherein the separation step includes decanting, centrifugation or filtration, or a combination thereof.

17. A partially or terminally differentiated neuronal cell, whenever produced by a method according to any one of the preceding claims.

18. A partially or terminally differentiated neuronal cell according to Claim 17, derived from a vertebrate selected from the group consisting of murine, human, bovine, ovine, porcine, caprine, equine and chicken.

19. A partially or terminally differentiated neuronal cell according to Claim 18, wherein the cells are dopaminergic (DA) neurons.

20. A partially or terminally differentiated neuronal cell according to Claim 18, wherein the cells are TH positive and resemble nerve cells morphologically, including the presence of axon-like projections.

21. A method for the production of genetically modified neuronal cells, said method including

providing

a source of genetically modified neurectoderm cells;

a culture medium;

a growth factor from the neural growth factor (NGF) family;

culturing the cells in the culture medium and in the presence or absence of the NGF growth factor to produce differentiated or partially differentiated genetically modified neurons.

22. A method according to Claim 21, wherein the culturing step is conducted in the presence of the NGF growth factor.

23. A method according to Claim 22, wherein the neurectoderm cells are *in vitro* derived neurectoderm cells.

24. A method according to Claim 23, wherein the neurectoderm cells are derived from differentiation of early primitive ectoderm-like (EPL) cells.

25. A method according to Claim 22, wherein the modification of the genes includes introducing extraneous DNA, removing DNA, or causing mutations within the DNA of the cells.

26. A method according to Claim 21, wherein the culturing step is conducted in the presence of the NGF growth factor and dopamine, to produce differentiated or partially differentiated genetically modified dopaminergic (DA) neurons.

27. A method according to Claim 26, wherein the resulting cell population contains a significant amount of cells that stain positive for TH and resembled nerve cells morphologically, including the presence of axon-like projections.

28. Use of genetically modified or unmodified neuronal cells produced according to any one of Claims 1 to 16 and 21 to 27, or their differentiated or partially differentiated progeny, for use in human cell therapy or transgenic animal production.

29. Use of genetically modified or unmodified neuronal cells produced according to any one of Claims 1 to 16 and 21 to 27, or their differentiated or partially differentiated progeny, for use in human or animal gene therapy.

30. A method for the treatment of neurodegenerative and central nervous system (CNS) disorders in mammals, including humans, which method includes utilising the neuronal cells produced according to any one of Claims 1 to 16 and 21 to 27 in cell replacement therapies.

31. A method according to Claim 30, wherein the neuronal cells include dopaminergic (DA) neurons.